INSTRUCTION MANUAL

FREQUENCY SELECTIVE VOLTMETER

MODEL 127C

Our Representative in Your Area Is:

Scientific Sales CORPORATION

7132 N. HARLEM AVENUE
CHICAGO, ILLINOIS 60631
PHONE (312) 775-7595

6121 EXCELSIOR BLVD.
MINNEAPOLIS, MINNESOTA 55416
PHONE (612) 929-6115

3720 N. COLORADO AVENUE
INDIANAPOLIS, INDIANA 46218
PHONE (317) 545-9950

Sierra
415-321 5374
Menlo Park Calif.
Bob Hicks

PHILCO

Ford

PHILCO-FORD CORPORATION
Sierra Electronic Operation
Menlo Park, Calif. • 94025

FREQUENCY SELECTIVE VOLTMETER
MODEL 127C

STOCK No. A02512700C PRICE $5.00

FEBRUARY 1967

214

404-447-6666

PHILCO Ford
PHILCO-FORD CORPORATION
Sierra Electronic Operation
Menlo Park, Calif. • 94025

PHONE 415 322-7222
TWX 910-373-1282

TABLE OF CONTENTS

		Page
Section I	GENERAL	
A.	PURPOSE	1-2
B.	DESCRIPTION	1-2
C.	SPECIFICATIONS	1-3
D.	INSTALLATION OF BATTERY CELLS	1-4
E.	INSTALLATION OF RECHARGEABLE CELLS	1-5
Section II	OPERATION	
A.	OPERATING CONTROLS AND INDICATORS	2-1
B.	OPERATING PROCEDURES	2-3
1.	Battery Check	2-3
2.	Operational Calibration	2-3
3.	Particular Frequency Range Calibration	2-3
4.	Line Measurements - 20 Pin Connector	2-4
5.	Line Measurements - Input Jacks	2-4
6.	Audio Monitoring	2-5
7.	Single Sideband Monitoring	2-5
Section III	THEORY OF OPERATION	
A.	FUNCTIONAL ANALYSIS	3-1
B.	CIRCUIT DESCRIPTION	3-3
1.	Input Module A1	3-3
2.	Reference Oscillator Module A2	3-3
3.	Mixer-Modulator Module A3.	3-4
4.	Variable Oscillator Module A4	3-4
5.	First IF Amplifier Module A5.	3-5
6.	Audio Amplifier and Detector Module A6	3-5
7.	Second IF Amplifier Module A7	3-6
8.	Meter Amplifier Module A8	3-6
9.	Carrier Reinsertion Oscillator Module A9	3-6
10.	Power Supply Circuits	3-7

Section IV MAINTENANCE Page

A. CALIBRATION 4-1

1. Reference Oscillator 4-1

B. TROUBLESHOOTING 4-2

1. General Outline 4-2
2. Gains and Signal Levels 4-2
3. Procedures 4-3
4. Typical Transistor Trouble Shooting 4-15

C. ALIGNMENT AND ADJUSTMENTS 4-17

1. 1305 KC IF Amplifier Alignment 4-17
2. Balanced Modulator Adjustment 4-17
3. 330 KC IF Amplifier Alignment 4-17
4. Variable Oscillator Alignment 4-18

Section V REPLACEABLE PARTS LIST

ADDENDUM MODEL 127BC BATTERY CHARGER

LIST OF ILLUSTRATIONS

Figure No. Page

1-1 Frequency Selective Voltmeters 1-1
3-1 Functional Block Diagram 3-2
4-1 Troubleshooting Test Setup 4-2
4-2 Module Location, Top View 4-4
4-3 Module Location, Rear View 4-5
4-4 Module Location, Bottom View 4-6
4-5 Typical Transistor Trouble Shooting Schematic 4-15
4-6 Model 127C Block Diagram 4-19
4-7 Model 127C Schematic Diagram 4-20

LIST OF TABLES

Table No.		Page
4-1	Module Trouble Isolation	4-7
4-2	Battery Circuit Trouble Shooting	4-8
4-3	A1 Input Module Trouble Shooting	4-9
4-4	A2 Reference Oscillator Trouble Shooting	4-9
4-5	A4 Variable Oscillator Trouble Shooting	4-10
4-6	A3 Mixer-Modulator Module Trouble Shooting	4-10
4-7	A5 First IF Amplifier Module Trouble Shooting	4-11
4-8	A7 Second IF Amplifier Module Trouble Shooting	4-12
4-9	A8 Meter Amplifier Module Trouble Shooting	4-13
4-10	A6 Audio Amplifier and Detector Module Trouble Shooting	4-13
4-11	A9 Carrier Reinsertion Oscillator Module Trouble Shooting	4-14
4-12	Transistor Voltage Measurements	4-16

Figure 1-1. Model 127C Frequency Selective Voltmeter

SECTION I
GENERAL

A. PURPOSE

The Sierra Model 127C Frequency Selective Voltmeter is designed to measure voltages from 245 microvolts to 9.75 volts in the frequency range of 2 to 350 kc when connected to a 600 ohm line. It is designed to measure dbm from -70 to +22 when connected to 600 ohm or 135 ohm lines. The narrow bandwidth makes it particularly useful for analyzing complex waveforms, determining carrier system levels, and checking amplitude modulation percentages.

B. DESCRIPTION

The Model 127C, Figure 1-1, is a fully transistorized, battery-operated instrument. Special features include a 20 pin Western Electric input connector for patching into 135 ohm telephone carrier systems, an internal oscillator for calibration purposes, carrier reinsertion oscillators for monitoring single sideband signals, a built-in speaker and headphone jacks for audio monitoring. The instrument is housed in a compact metal cabinet.

The front panel contains all of the operating controls and is protected from damage by a metal cover that fastens in place by snaps. The function selector switch must be in the off position before the cover can be closed, thereby preventing the possibility of battery discharge while the instrument is not in use. The major portion of the circuitry is laid out on printed circuit boards and assembled into nine separate modules that are mounted on a main chassis by stand-off spacers. Extensive shielding is provided for modules and components to prevent interaction between circuits. The instrument is powered by six size D, 1.5 volt, zinc-carbon cells which provide up to 100 hours operation, or by seven nickel-cadmium rechargeable cells. Provision is made for changing batteries without removing the instrument from the case. Rechargeable cells may be charged through an external charge jack located on the end of the battery case.

C. SPECIFICATIONS

FREQUENCY RANGE	2 kc to 350 kc
INPUT LEVEL	-70 dbm to +22 dbm
ACCURACY	
Frequency	±1 kc
Measurement	±1 db
BANDWIDTH	
Meter Channel	
Standard Model 127C	250 cps (±125 cps) 3 db down 600 cps, 35 db down 1000 cps, 60 db down
127C-1 Option	100 cps (±50 cps) 3 db down 240 cps, 35 db down 450 cps, 60 db down
127C-5 Option	500 cps (±250 cps) 3 db down 1250 cps, 35 db down 2200 cps, 60 db down
Audio Channel	2500 cps, 6 db down 3800 cps, 20 db down
METER READING (Direct)	Dbm on 135 ohm and 600 ohm balanced or unbalanced lines. Voltage in 600 ohm input position only
SPURIOUS RESPONSE	Greater than 50 db down
INTERMEDIATE FREQUENCIES	
First IF	1305 kc
Second IF	330 kc
BRIDGING LOSS	Not greater than 0.25 db in either 135 ohm or 600 ohm position
POWER REQUIREMENTS	6 Zinc-Carbon or 7 Nickel-Cadmium rechargeable size D cells
Voltage	9 volts nominal
Current Without Audio	20 ma
With Audio	42 ma

Voltage Range (Fully charged to discharged range)	
Nickel-Cadmium Rechargeable	8.75 to 8.40 volts
Zinc-Carbon	9.15 to 8.40 volts
Battery Life	100 hours, Zinc-Carbon cells
TEMPERATURE	-10°C to +50°C (+14°F to +122°F)
DIMENSIONS (Including Front Cover)	
Width	12 inches
Height	7.5 inches
Depth	7.5 inches
WEIGHT	15 pounds

D. INSTALLATION OF BATTERY CELLS

The voltmeter and six size D zinc-carbon cells, wrapped separately, are shipped in a corrugated fiberboard container.

CAUTION

The cells must be installed in accordance with the polarity markings on the battery pack. Improper installation will result in impared or non-operation of the instrument.

Access to the battery pack is through an opening in the left hand end of the instrument case. To install cells provided, or to replace worn out cells, proceed as follows:

1. Pull out the plungers in the two Nylatch fasteners and lift off plate.

2. Unscrew thumbscrew and lift off cover of battery pack. (Figure 4-3).

3. Place cells in tubes observing polarity markings. + means positive terminal up.

4. Replace battery pack cover. Be sure aligning pin fits into small hole made to receive it. The positive battery connector fits into a recessed epoxy-fiberglas disc to make contact.

5. Place outer cover plate fasteners in the two holes provided and push in plungers to lock in place.

E. INSTALLATION OF RECHARGEABLE CELLS

Since seven rechargeable cells are required, one of the spacers must be removed from the battery container. To remove spacer:

1. Unsolder connection between 2nd IF Amplifier Module A7 and 2nd LO and Audio IF Amplifier Module A5B.

2. Remove four screws holding Module A7 to chassis. Move it away from end of battery container.

3. Remove 4-40 screw in upper battery contact spring. Spacer will now slide out of battery container.

4. Replace 4-40 screw in battery contact spring with the head inside, and secure it with a nut and lock washer. Spring contact assembly may be detached, to replace contact screw, by removing the two hex-head screws holding it to the battery container.

5. Reassemble in reverse order.

6. When Nickel-Cadmium cells are used, the battery may be charged only when the FUNCTION switch is in the OFF CHG position. To charge battery:

   a. Place FUNCTION selector switch in OFF CHG position.

   b. Connect a Sierra Model 127BC Battery Charger to the External Charge jack, J5.

   c. Turn 127BC ON and adjust for desired charging rate with FAST - SLOW switch on charger.

SECTION II
OPERATION

A. OPERATING CONTROLS AND INDICATORS (Figure 1-1)

PANEL MARKING	DESCRIPTION	FUNCTION
FUNCTION	5 position rotary switch	(1) OFF position disconnects battery from voltmeter circuits (2) BATT position checks condition of battery under full load (3) CAL position connects internal reference oscillator output to the voltmeter circuits for instrument calibration (4) 135 ohm position provides proper internal connections for 135 ohm lines connected to INPUT jacks or 20 pin connector (5) 600 ohm position provides proper internal connections for 600 ohm lines connected to INPUT jacks only
SELECTOR	9 position rotary switch	(1) INPUT position connects voltmeter input circuits to INPUT jacks. (2) IN and OUT positions connect voltmeter input circuits to 20 pin Western Electric connector

MODULATION	3 position rotary switch	(1) LS and US connect either lower or upper carrier reinsertion oscillators (2) AM carrier reinsertion oscillators disconnected
ATTENUATOR	17 position rotary switch	Serves as a level range control to adjust voltmeter sensitivity in 5 db steps over an 80 db range
MAIN TUNING	Gear driven tuning	Tunes voltmeter to frequency indicated on dial face
MAIN TUNING Index Control (inner knob)		Adjusts index pointer when calibrating
FINE	Vernier tuning	Fine tuning adjustment
CAL	Potentiometer	Adjusts overall voltmeter gain when calibrating
AUDIO GAIN	Potentiometer and Switch	Adjusts audio output level. Turns on audio amplifier
PHONE	Headphone jack	Provision for audio monitoring
20 pin Western Electric connector		Telephone directional circuit-connector for 135 ohm line measurement only
INPUT		Input connectors for 135 ohm or 600 ohm line measurements. Shorting link used for unbalanced lines
SSB ZERO	Potentiometer	Very fine tuning for single sideband carrier reinsertion

B. OPERATING PROCEDURES

1. BATTERY CHECK. This check tests the condition of the batteries while the batteries are delivering full load current. To check the batteries, proceed as follows:

a. Place FUNCTION switch to BATT position.

b. Observe meter. If needle is within green band, batteries are satisfactory. If needle is below green band, replace the six battery cells before continuing tests.

2. OPERATIONAL CALIBRATION. This procedure calibrates the main tuning dial and the overall voltmeter sensitivity. To calibrate the voltmeter, proceed as follows:

a. Set FUNCTION selector switch to CAL position.

b. Set ATTENUATOR selector switch to 0 db CAL position.

c. Rotate MAIN TUNING dial control to 25 kc.

d. Adjust FINE tuning control for maximum indication on dbm meter.

e. Adjust MAIN TUNING index control until index pointer is directly below the 25 kc mark on main tuning dial face.

f. Adjust CAL control for 0 dbm indication on dbm meter.

The voltmeter is now calibrated.

3. PARTICULAR FREQUENCY RANGE CALIBRATION.

a. Rotate the MAIN TUNING dial control to red mark nearest the frequency to be measured.

b. Rotate ATTENTUATOR selector switch until dbm meter indication is in upper half of scale.

c. Adjust FINE tuning control for maximum indication on dbm meter.

d. Adjust MAIN TUNING index control until index pointer is directly below red mark on main tuning dial face. The voltmeter is now calibrated for the frequency range to be measured.

4. LINE MEASUREMENTS - 20 PIN CONNECTOR. The 20 pin Western Electric connector is provided for patching into 135 ohm carrier lines. To perform 135 ohm carrier line measurements, proceed as follows:

a. Patch voltmeter to circuit to be tested.

b. Calibrate voltmeter per paragraph 2.

c. Set FUNCTION selector switch to 135 ohm position.

d. Set SELECTOR switch to directional circuit to be measured.

e. Rotate MAIN TUNING dial control to frequency corresponding to directional circuit under test.

f. Rotate ATTENUATOR selector switch until dbm reading is in upper half scale.

g. Adjust FINE tuning control for maximum indication on dbm meter.

h. Read dbm meter indication. To obtain the input signal level, algebraically add the dbm meter indication to the attenuator setting.

5. LINE MEASUREMENTS - INPUT JACKS. The INPUT jacks are provided for making measurements on 135 ohm or 600 ohm, balanced or unbalanced lines. To perform line measurements, proceed as follows:

a. Connect voltmeter to circuit to be tested. For unbalanced lines, use shorting link. For balanced lines, disconnect shorting link.

b. Calibrate voltmeter per paragraph 2.

c. Set FUNCTION selector switch to desired impedance setting (600 ohm or 135 ohm).

d. Set SELECTOR switch to INPUT position.

e. Rotate MAIN TUNING dial control to frequency of signal to be measured.

f. Rotate ATTENTUATOR selector switch until dbm meter indication is in upper half of scale.

g. Adjust FINE tuning control for maximum indication on dbm meter.

h. Read dbm meter indication. To obtain the input signal level, algebraically add the dbm meter indication to the attenuator setting.

6. AUDIO MONITORING. Audio modulation on line signals may be monitored with a built-in speaker, or headphones may be used. To use the speaker, turn the AUDIO GAIN control On and adjust for a suitable listening level. If headphones are used, the speaker is disconnected when they are plugged into the PHONES jack. Phones with a single plug must be placed in the lower jack.

CAUTION

To conserve battery power, keep the AUDIO GAIN control switch in the OFF position. Continuous use of the Audio will considerably reduce battery life.

7. SINGLE SIDEBAND MONITORING

a. Connect voltmeter to circuit to be tested. For unbalanced lines use shorting link. For balanced lines disconnect shorting link.

b. Calibrate voltmeter per paragraph 2.

c. Set FUNCTION selector switch to desired impedance setting (600 ohm or 135 ohm).

d. Set SELECTOR switch to LS (lower sideband) or US (upper sideband) as desired.

e. Rotate MAIN TUNING dial control to frequency of signal to be monitored.

f. Rotate ATTENUATOR selector switch until dbm meter indication is in upper half of scale.

g. Rotate AUDIO GAIN switch to turn on audio amplifier and adjust AUDIO GAIN control for a suitable listening level. If headphones are used, the speaker is automatically disconnected.

h. Adjust FINE tuning control for minimum distortion in audio signal.

i. Make final adjustment for exact tuning (undistorted audio signal) with SSB ZERO control.

NOTE

With the voltmeter calibrated and operating normally, internally generated noise will deflect the meter slightly upscale. This noise should not exceed the -20 db mark on the meter and does not affect the measuring accuracy over the specified range.

Never adjust the mechanical "zero set" on the meter unless battery is turned off.

SECTION III
THEORY OF OPERATION

A. FUNCTIONAL ANALYSIS

The Model 127C employes a dual conversion superhetrodyne circuit to measure frequencies in the range of 2 kc to 350 kc, with an optional band pass of 100, 250, or 500 cps. Figure 3-1 is a functional block diagram of the frequency selective voltmeter.

At the input of the voltmeter, selector switches are used to select an input signal from either the 25 kc reference oscillator or from the front panel input connectors. A filter and matching network is incorporated in the input circuits to attenuate unwanted high frequency components and to provide proper input impedances. To control the sensitivity of the voltmeter, a variable attenuator provides up to 80 db of attenuation in 5 db steps.

Tuning of the voltmeter is accomplished by a variable oscillator that operates over the frequency range of 1305 kc to 1655 kc. Both the input signal and the variable oscillator signal are applied to a mixer stage where the first heterodyning action takes place to produce a 1305 kc difference frequency. The first IF amplifier is tuned to 1305 kc and amplifies the output of the first mixer.

A second mixer stage heterodynes a 1635 kc local oscillator signal with the first IF signal to produce a 330 kc difference frequency. The narrow bandpass of the voltmeter is determined by a crystal filter located between the second mixer and the second IF. After amplification by the second IF amplifier, the signal is rectified and filtered in a meter detector circuit and then applied to the dbm meter.

An additional second mixer output is fed through a ceramic bandpass filter to an audio circuit where audio components of the input signal are detected and amplified. The built-in speaker may be used to monitor these signals, or if desired, headphones may be used.

The output of a carrier reinsertion oscillator, introduced into the modulator, provides the RF base with which the single sideband signals beat to restore the AM signal. Audio from this restored signal is recovered in the audio detector.

The reference oscillator generates a 25 kc square wave and is set to provide an output level that is equivalent to 0 dbm at the input connectors. Before voltage measurements are made, the voltmeter sensitivity is calibrated by connecting the reference oscillator output to the voltmeter input circuits and adjusting the second IF amplifier gain (CAL) for a 0 dbm indication. In addition, the high harmonic output of the square wave oscillator provides check points every 25 kc (figures marked in red) from 25 kc to 350 kc for particular frequency range calibration. (See Section II paragraph B. 3.)

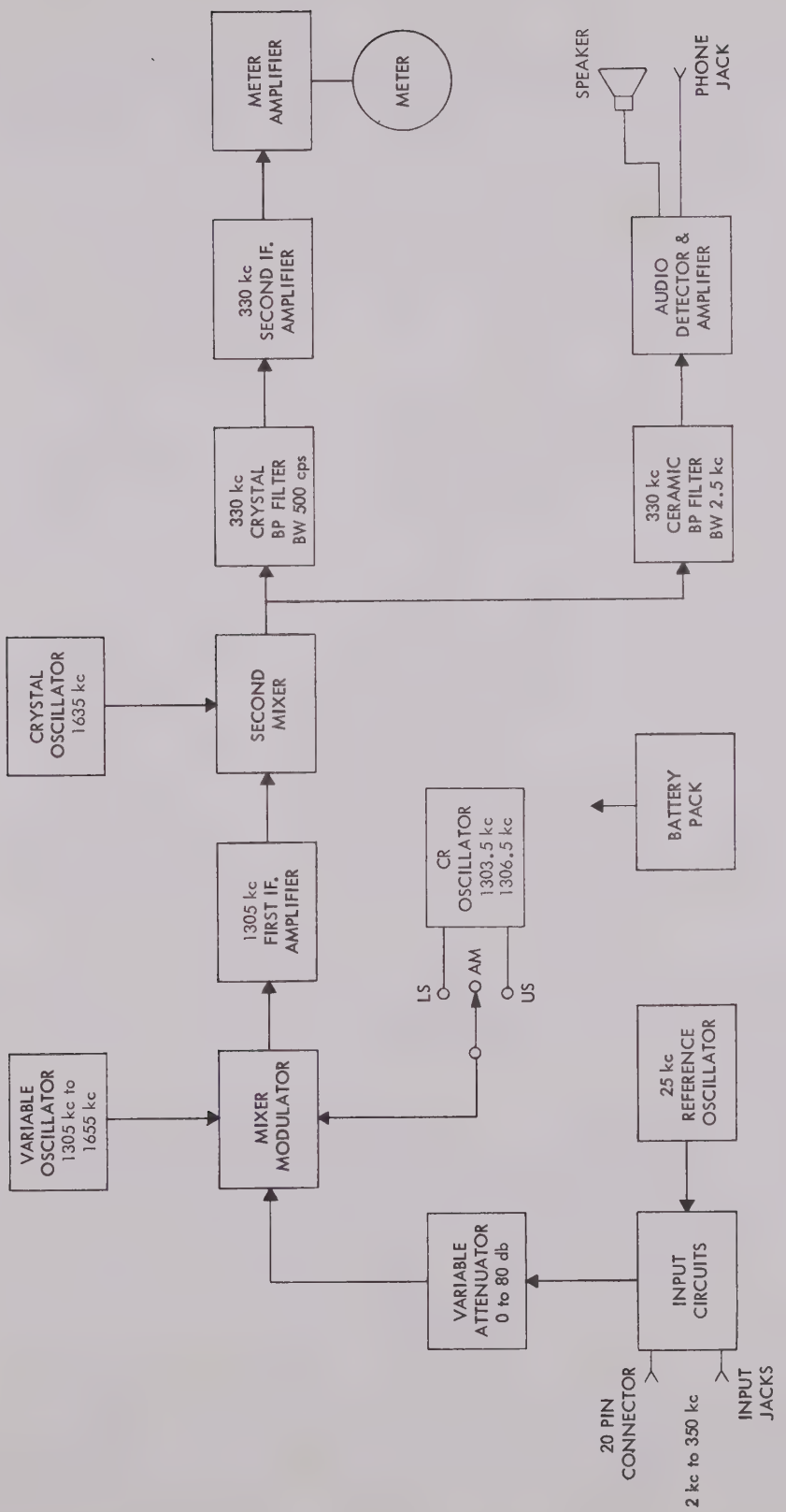


Figure 3-1. Model 127C Functional Block Diagram

When making measurements, the variable attenuator is used to change the voltmeter sensitivity in calibrated steps of 5 db. For example, assume that a signal level of - 19 dbm is applied to the input of a calibrated voltmeter. By adjusting the attenuator to the -20 db position, the voltmeter sensitivity increases 20 db, resulting in an indication of +1 dbm. The input level is determined by algebraically adding the meter indication to the attenuator setting: -20 dbm +(+1) dbm = -19 dbm.

B. CIRCUIT DESCRIPTION

1. INPUT MODULE A1

The input circuits (Figure 4-7) are composed of three selector switches, an isolation transformer, a filter matching network, a low-pass filter, and an 80 db attenuator. Input signals are applied to either the 20 pin Western Electric connector J1 or to the line input jacks J2, J3, J4. The SELECTOR switch, S3, in conjunction with FUNCTION switch, S1, selects and applies the proper input signal to transformer T1.

In operation, the voltage applied to the low-pass filter must be 0.121 volts with 0 dbm at the input connectors. Since 0 dbm corresponds to 0.775 volt on a 600 ohm line and 0.367 volt on a 135 ohm line, compensation is necessary. Isolation transformer T1 and filter matching resistors R13 and R14 serve to compensate for this input signal voltage difference. The primary windings of T1 are connected in parallel for 135 ohm operation and in series for 600 ohm operation. With a 0 dbm input signal, this arrangement results in secondary voltages of 0.232 volts for the parallel connection and 0.245 volts for the series connection. The FUNCTION selector switch inserts the proper resistance between the secondary of transformer T1 and the low-pass filter to drop the secondary voltage to 0.121 volt.

After selection, compensation, and matching, the signal is applied to a low-pass filter consisting of inductors L1 through L4 and capacitors C1 through C5. The filter, which is constant K derived, has a frequency cutoff of 500 kc and provides 60 db of rejection to the first IF amplifier frequency (1305 kc).

The variable attenuator, which is used to control the voltmeter sensitivity, consists of switch S2 and resistors R2 through R12. These components are arranged to provide up to 80 db of attenuation to the input signal in 5 db steps. When the front panel setting is 0 db the attenuator provides 60 db of attenuation. Rotating the attenuator switch to the -60 db position removes all attenuation from the circuit, thereby increasing the voltmeter sensitivity by 60 db.

2. REFERENCE OSCILLATOR MODULE A2

The reference oscillator module (Figure 4-7) is made up of a stable, crystal controlled, temperature compensated oscillator and amplifier that produces a square-topped wave. Zener diode, CR1, provides a regulated supply voltage. Diode

CR2 and CR4 have a temperature characteristic that complements the temperature characteristic of transistors Q1 and Q2. Base bias for Q1 is furnished by the small voltage drop across CR2. One side of the sine wave output of the crystal oscillator is clipped in this circuit. The other side is clipped in the collector circuit of Q2 due to the clamping action of CR3. Thus the output of the reference oscillator appears across R9 as a square-topped wave, stable as to frequency and level. The correct calibrating level is adjusted by R9.

When it is desired to calibrate the voltmeter, the FUNCTION selector switch is set to the CAL position to apply the reference oscillator signal to the low-pass filter in the input module. (See para. A. above.) When the FUNCTION selector switch is in any position other than the CAL position, the power supply is disconnected from the reference oscillator collector circuits. This arrangement reduces battery drain when the oscillator is not in use.

3. MODULATOR MODULE A3

The Modulator circuit (Figure 4-7) is made up of an emitter follower input amplifier (Q1), a Ring Modulator (CR1-CR4, R5-R9, C4, C5, T1 and T2) and an IF Buffer Amplifier (Q2).

The signal from the Variable Oscillator (A4) is applied through T2 to opposite corners of the Ring-bridge. The input signal from Q1 is applied between the center-taps of transformers T1 and T2. Depending upon the polarity of the Variable Oscillator signal applied through T2, either the path through CR1 and CR2 or the path through CR3 and CR4 is open to the input signal. The input signal is thus alternately switched through each half of the windings of T1. The input signal is nullified in T2 because it flows through both sides of the windings.

Switching the input signal through each half of the primary of T1 at the Variable Oscillator frequency produces frequencies in the secondary that are the sum and difference of the Input signal from Q1 and the Variable Oscillator signal from A4.

The secondary of T1 is connected to the base of the Buffer Amplifier (Q2). Since the collector circuit of Q2 and the following IF Amplifier (A5) are tuned to 1305 kc/s (the difference frequency) this frequency is selected and amplified. The Variable Oscillator frequency is balanced out by the adjustment of R5 and C5 and does not appear at the output of A3. The Buffer Amplifier provides isolation between the Modulator and the First IF Amplifier and contributes about 2 dB of voltage gain.

4. VARIABLE OSCILLATOR MODULE A4

The variable oscillator circuit (Figure 4-7) consists of a Clapp oscillator and an emitter follower. The temperature stabilized oscillator Q1 provides an output level

of 0 dbm with a total variation of 0.25 db and can be tuned over the frequency range of 1310 kc to 1660 kc. Capacitors C5, C6, C8, C9 and C14 and inductor L2 comprise the frequency determining components. Capacitor C9 is connected to the main tuning control. C8 and C14 are temperature compensating capacitors. L1, C2 in the collector circuit of Q1 is a frequency compensating circuit to increase output level stability.

Capacitor C7 couples the oscillator output to an emitter follower, Q2, that is used for impedance matching and isolation. The emitter follower presents a high impedance to the oscillator and appears as a low impedance driving source for the balanced modulator.

In the collector supply line of the reference oscillator, a decoupling network, L3, C11, C12 and C13, isolates the oscillator from the power supply circuits.

5. FIRST IF AMPLIFIER MODULE A5

The first IF module circuits (Figure 4-7) consist of a two stage 1305 kc IF amplifier, a second mixer, a 1635 kc second local oscillator and a three stage resistance coupled amplifier. Common emitter IF amplifiers Q1 and Q2 provide an overall voltage gain of 11 db and employ both ac and dc feedback to achieve gain stabilization under temperature and power supply variations. The collector load impedance and the base impedance are resonant tuned circuits. Coupling between stages is by means of coupling capacitors only. The IF output is fed to the base of the second mixer stage Q3 where second conversion takes place.

The local oscillator signal that is used for second conversion is supplied by a 1635 kc crystal controlled oscillator and is applied to the base of the mixer stage Q3. The second mixer produces a 330 kc second IF frequency that is fed to the IF amplifier module A7 and also to the input of Q5. Reduction of 1635 kc signal components in the output circuit of mixer Q3 is achieved by a low-pass filter composed of L5 and C19.

Amplifiers Q5, Q6 and Q7 provide amplification for the 330 kc signal and incorporate a ceramic bandpass filter, FL1, to achieve the desired selectivity before the signal is coupled to the audio circuits. Emitter follower amplifier Q7 is coupled to the audio amplifier and detector module A6 through C1, located on module A6.

6. AUDIO AMPLIFIER AND DETECTOR MODULE A6

The audio amplifier circuits (Figure 4-7) consist of a detector and a two stage audio amplifier. Common emitter amplifier Q1 and diode CR1 serves as a low-level detector. Briefly the action is as follows: During the negative half of the input cycle there is 100% feedback through CR1 so practically no output signal will appear across the collector load resistor R17. When the input signal is positive going, the amplification is normal since there is no feedback through CR1 and an output signal will be developed. C4, C5 and R6 make up a low-pass filter to remove the IF components. Since the negative portion of the input signal is not developed in the output and the IF components

are filtered out, the audio component of the signal will remain as the output developed across the portion of R17 between the slider arm and ground.

Detector output is taken from the top of the AUDIO GAIN control, R17, and applied to the driver amplifier Q2. A push-pull amplifier, Q3-Q4, further amplifies the signal and provides adequate output to drive either headphones or the built-in speaker, LS1. When headphones are plugged in the speaker is automatically disconnected. Single plug phones must be plugged into J6, the lower jack. When double plug phones are used the signal is connected from sleeve to sleeve.

Since the Audio Amplifier and Detector module current consumption is about 22 milliampleres, it should be turned off except when audio monitoring is necessary in order to conserve battery power. B- is disconnected from the module by rotating the AUDIO GAIN control full counter-clockwise.

7. SECOND IF AMPLIFIER MODULE A7

The second IF amplifier (Figure 4-7) consists of a 330 kc amplifier and a narrow bandpass crystal filter. Before amplification, the 330 kc IF signal is applied to a 330 kc crystal filter that provides a 3 db bandwidth of 100, 250, or 500 cps, depending on the model. This filter determines the overall selectivity. Two stages of IF amplification are provided by Q1 and Q3. Each amplifier uses a single tuned tank circuit, emitter feedback and capacitive coupling. In addition, amplifier Q3 has a potentiometer in the emitter circuit for CAL adjustment. The overall gain, including input filter and crystal filter losses, is adjustable from +25 db to +55 db.

The collector supply line is decoupled by inductors L4, L5, L6 and capacitors C12, C13 and C14 to prevent interaction between IF amplifier stages. The output is coupled by capacitor C11 to the meter amplifier A8.

8. METER AMPLIFIER MODULE A8

The meter amplifier is a two stage feedback amplifier employing a large amount of negative feedback. The meter rectifier is a bridge type, which with the large feedback factor of the amplifier, provides a meter indication which is very linear over its full range. The meter has a 200 microampere movement and is calibrated in dbm and volts. The dbm readings apply to both 600 ohm and 135 ohm line measurements, but the voltage scale applies to measurements in the 600 ohm position only.

9. CARRIER REINSERTION OSCILLATOR MODULE A9

The carrier reinsertion oscillator is similar to the 1635 kc second IF crystal controlled local oscillator, the only difference is that the two crystals Y1 and Y2 are 1.5 kc below and above the 1305 kc first IF frequency respectively. One of these two signals is applied, as required, together with the variable oscillator signal to the modulator where it is combined with the carrier-suppressed sideband signal. The inserted carrier from the internal oscillator provides an RF base against which sidebands beat, forming a combined signal which is reduced to its audio components at the audio detector. LS-AM-US switch, S4, selects the proper oscillator, and applies collector supply voltage for its operation. See Figure 4-7.

10. POWER SUPPLY CIRCUITS

The power supply circuit consists of six 1.5 volt zinc-carbon or seven nickel-cadmium rechargeable, size D cells connected in series to provide a nominal supply voltage of 9 volts. Since the voltmeter circuits use pnp transistors, requiring a negative collector voltage, the positive terminal of the battery is grounded. The negative battery terminal is connected to the arm of FUNCTION selector switch, S1C.

When the selector switch is in the BATT position, the switch connects the power supply to the meter through resistor, R11. The circuit is completed through CR1, R9 and R10 to ground. In this switch position the INPUT jacks are disconnected, but the instrument is turned on, so the true state of the batteries is indicated. When the FUNCTION switch is in either the 135 ohm or the 600 ohm position, the battery is connected to all modules except the reference oscillator. In the CAL position, the battery is connected to all modules of the voltmeter. The battery is disconnected from the voltmeter circuits in the OFF CHG position.

When nickel-cadmium cells are used, the battery may be recharged only when the FUNCTION switch is in the OFF CHG position. (See Section I paragraph E. 6.)

SECTION IV
MAINTENANCE

A. CALIBRATION

1. REFERENCE OSCILLATOR

In the event of parts replacement or normal aging of components recalibration may be desirable. This is accomplished by comparing the reference oscillator output level to a known external source. Before proceeding with step a., refer to paragraph B.3.a. below, connect the signal generator and VTVM to the Frequency Selective Voltmeter as shown in Figure 4-1 and proceed as follows:

a. Adjust Frequency Selective Voltmeter controls as follows:

FUNCTION	600 ohms
SELECTOR	INPUT
ATTENUATOR	0 CAL
MAIN TUNING	25 kc

b. Adjust signal generator frequency to 25 kc.

c. Adjust signal generator output for 0 dBm as measured on VTVM.

d. Adjust FINE tuning control for maximum indication on dBm meter of Frequency Selective Voltmeter.

e. Adjust MAIN TUNING index control until index pointer is directly below the 25 kc mark on main tuning dial face.

f. Adjust CAL gain control until dBm meter indicates 0 dBm.

g. Set FUNCTION selector switch to CAL position.

h. At module A2 adjust level potentiometer, R9, (Figure 4-4) until meter indicates 0 dB. The voltmeter is now calibrated and ready for use.

i. In order to maintain the inherent accuracy of the Voltmeter the Balanced Modulator should be checked periodically. Procedure for this adjustment is given in paragraph C.2.

B. TROUBLE SHOOTING

1. GENERAL OUTLINE

The trouble shooting procedures consist of three parts: isolation to a particular module, module trouble shooting and transistor voltage checks. These procuedures are presented in tables. Table 4-1 provides a step by step procedure to isolate trouble to a particular module or circuit. When the trouble has been isolated to a particular module, follow the instructions given by the appropriate module trouble shooting table (Tables 4-2 through 4-11). These tables provide step by step procedures to perform trouble shooting at the module level. When the trouble has been isolated to a particular transistor or stage, check the voltages given in Table 4-12. Refer to Figures 4-2, 4-3 and 4-4 for module locations.

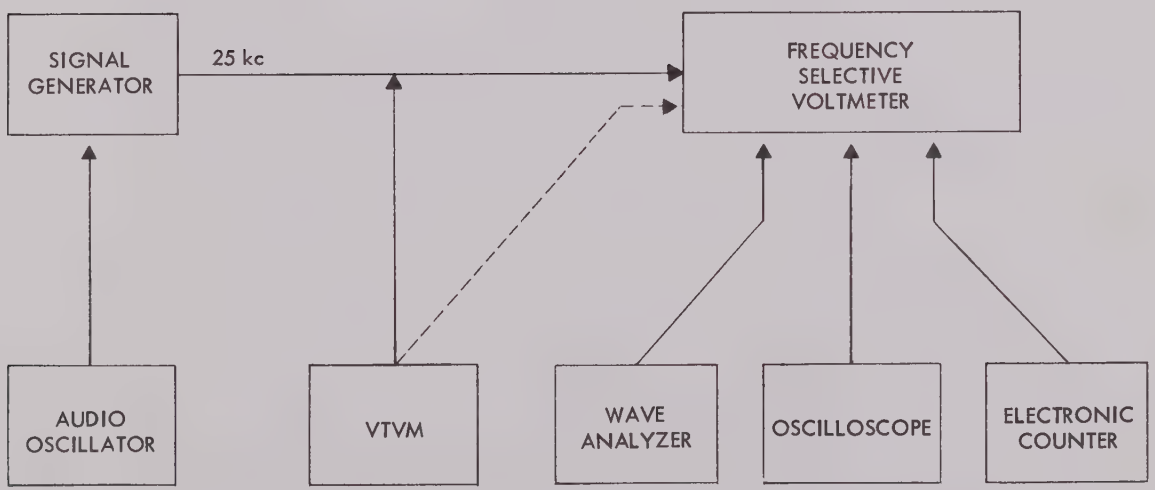


Figure 4-1. Trouble Shooting Test Setup

2. GAINS AND SIGNAL LEVELS

To aid in trouble shooting, Figure 4-6 illustrates the stages that comprise the Frequency Selective Voltmeter and provides gain figures and signal levels. Figure 4-7 is the schematic diagram.

3. PROCEDURES

Before proceeding with Step 1 in Table 4-1, connect the voltmeter in the test setup shown in Figure 4-1. Signal generator to be connected to INPUT jacks.

a. Test Equipment Required

(1) Multimeter, Simpson 260 or equivalent

(2) AC VTVM, HP 400L or equivalent

(3) Signal Generator, General Radio 1001A or equivalent

(4) Wave Analyzer, Sierra 128A, 126A or equivalent

(5) Audio Oscillator, HP 200CD, or equivalent

(6) Counter, HP 524C or equivalent

(7) Oscilloscope, Tektronix 533 or equivalent

(8) DC VTVM, HP 412A, or equivalent

(9) Sierra Model 219C In-Circuit Transistor Tester, or equivalent

b. Set the Frequency Selective Voltmeter controls as follows:

FUNCTION	600 ohms
SELECTOR	INPUT
ATTENUATOR	0 CAL
MAIN TUNING	25 kc

c. Adjust the signal generator for a 0 dBm 25 kc signal output as read on VTVM.

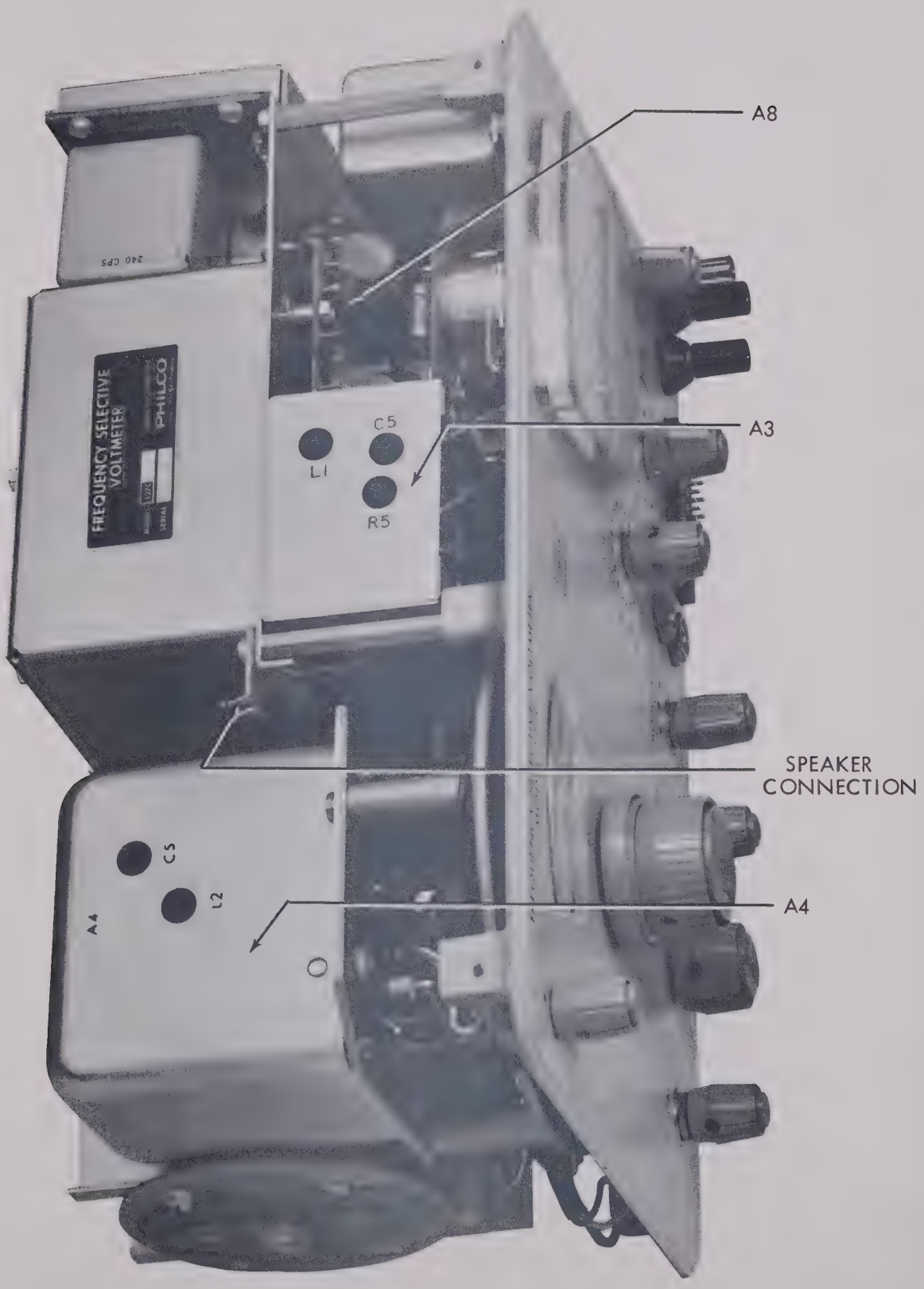


Figure 4-2. Model 127C Module Location, Top View

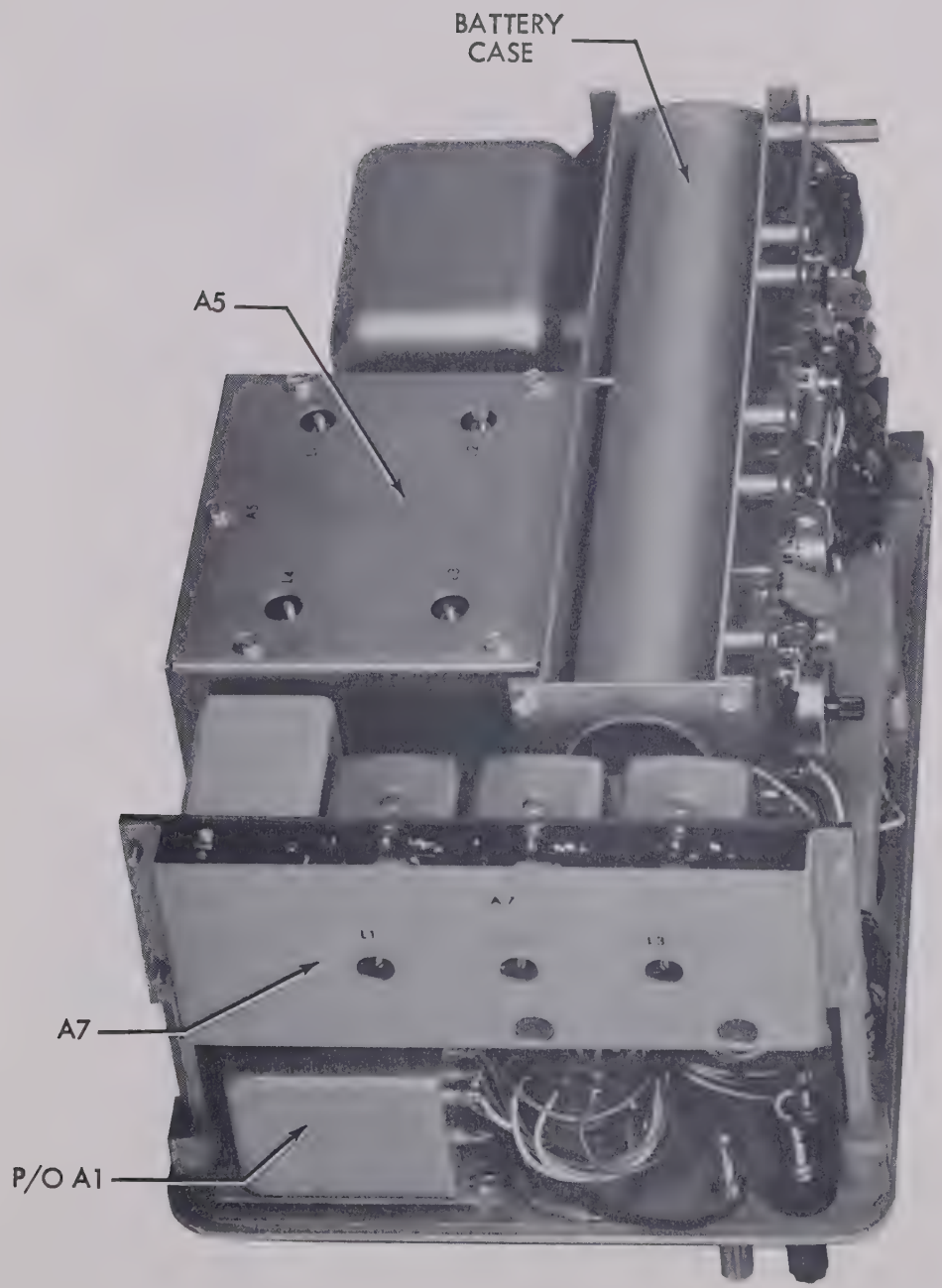


Figure 4-3. Model 127C Module Location, Rear View

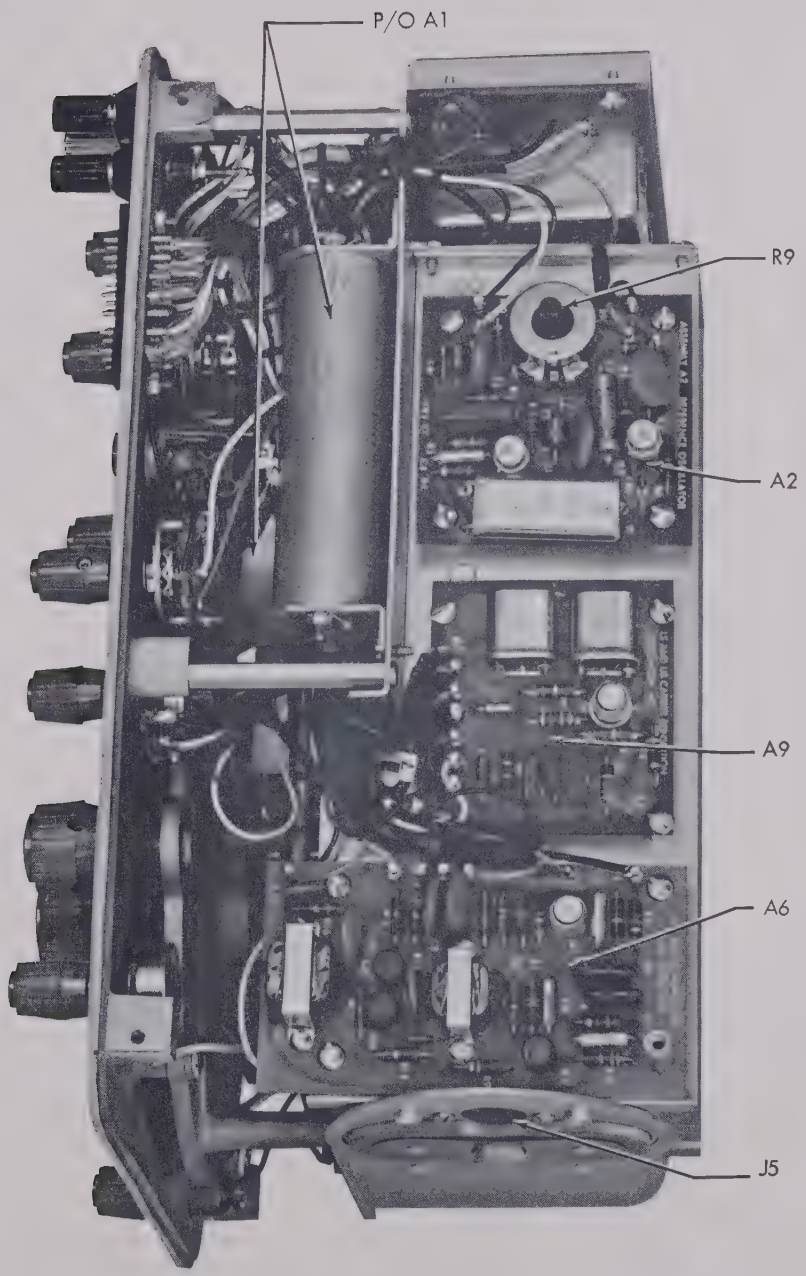


Figure 4-4. Model 127C Module Location, Bottom View

TABLE 4-1

MODULE TROUBLE ISOLATION

STEP	PROCEDURE	NORMAL INDICATION*	IF INDICATION IS ABNORMAL
1.	Place FUNCTION switch in BATT position.	Meter reads within green band.	Replace batteries. Trouble is in battery circuits. See Table 4-2.
2.	Place FUNCTION switch to 600 ohms Connect Wave Analyzer to C1 on module A3.	Wave Analyzer indicates a -76 dBm, 25 kc signal.	Trouble is in input module A1. See Table 4-3.
3.	Place FUNCTION switch to CAL. Connect VTVM to arm of R9 in module A2.	VTVM indicates -16 dBm.	Trouble is in reference Oscillator module A2. See Table 4-4.
4.	Place FUNCTION switch to 600 ohms Connect VTVM to C10 on module A4.	VTVM indicates -6 dBm	Trouble is in variable oscillator module A4. See Table 4-5.
5.	Place ATTENUATOR switch to 0 dBm and selector to INPUT. Connect Wave Analyzer to C1 on module A5.	Wave analyzer indicates a -83 dBm, 1305 kc signal.	Trouble is in mixer-modulator module A3. See Table 4-6.
6.	Connect wave analyzer to C1 on module A7.	Wave analyzer indicates -43 dBm, 330 kc signal	Trouble is in first IF module A5. See Table 4-7.
7.	Connect VTVM to C11	VTVM indicates -20 dBm	Trouble is in second IF module A7. See Table 4-8.
8.	Connect VTVM to collector of Q2 on module A8.	VTVM indicates -2 dBm	Trouble is in meter detector module A8. See Table 4-9.

*Some variation from these values is to be expected in different instruments.

TABLE 4-1 (Continued)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
9.	Set ATTENUATOR to 0 dbm. Connect VTVM to C1 on module A6. Set signal generator for 400 cycle 50% AM modulation.	VTVM indicates -45 dBm.	Trouble is in first IF module A5. See Table 4-7.
10.	Connect VTVM to collector of Q3 on module A6. Plug high impedance head phones into PHONES jack. If phones are not available, use 1K resistor.	VTVM indicates +2 dBm	Trouble is in audio amplifier and detector module A6. See Table 4-10.

TABLE 4-2

BATTERY CIRCUIT TROUBLE SHOOTING

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1.	Connect a multimeter to negative side of battery pack.	METER indicates -7.5 volts to -9 volts DC.	Check contacts in battery pack. Check battery.
2.	Place FUNCTION switch to BATT position. Connect multimeter to pin 1 of switch S1C.	METER indicates -7.5 volts to -9 volts DC	Check FUNCTION selector switch S1C in input module.
3.	Place FUNCTION switch to 600 or 135 ohm position. Connect a multimeter to pin 4 of switch S1C.	METER indicates -7.5 volts to -9 volts DC	Check FUNCTION selector switch S1C in input module.

TABLE 4-3

A1 INPUT MODULE TROUBLE SHOOTING
(With 25 kc 0 dbm signal to INPUT jacks)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1.	Place FUNCTION switch to 600 ohms. Connect VTVM to pin 9 of FUNCTION switch S1A.	VTVM indicates 0.123 volts AC.	Check capacitor C6, transformer T1, switch S1 and resistors R13 and R14.
2.	Connect VTVM to output pin of low-pass filter.	VTVM indicates 0.123 volts AC.	Check low-pass filter.
3.	Connect VTVM to pin 14 of ATTENUATOR switch S2A. Rotate FUNCTION selector switch over entire attenuation range in 5 db steps.	VTVM indicates voltage change in 5 db steps.	Check resistors R1 through R12 and switch S2.

TABLE 4-4

A2 REFERENCE OSCILLATOR TROUBLE SHOOTING

STEP	PROCEDURE	NORMAL INDICATION*	IF INDICATION IS ABNORMAL
1.	Place FUNCTION switch to CAL. Connector multimeter to junction of CR1 and CR3	METER indicates -5.5 volts DC.	Check resistor R1 and diode CR1.
2.	Connect oscilloscope to collector of Q1.	Oscilloscope displays 4 volt peak, 25 kc square wave.	Check transistor Q1. See voltage charts in Table 4-12
3.	Connect oscilloscope to collector of Q2.	Oscilloscope displays 6 volt peak-to-peak 25 kc square wave.	Check transistor Q2. See voltage charts in Table 4-12

*Some variation from these values is to be expected in different instruments.

TABLE 4-5

A4 VARIABLE OSCILLATOR TROUBLE SHOOTING

STEP	PROCEDURE	NORMAL INDICATION*	IF INDICATION IS ABNORMAL
1.	Place FUNCTION switch to 600 ohms. Connect a multimeter to collector of Q2 in module A4.	METER indicates -7.5 volts to -9 volts DC.	Check inductor L3, and capacitors C12, and C13.
2.	Connect oscilloscope to collector of Q1.	Oscilloscope displays 1.2 volts peak-to-peak, 1330 kc signal.	Check transistor Q1. See voltage charts in Table 4-12.
3.	Connect oscilloscope to emitter of Q2.	Oscilloscope displays 1.1 volts peak-to-peak, 1330 kc signal.	Check transistor Q2. See voltage charts in Table 4-12.
4.	If electronic counter is available, connect it to collector of Q1. Rotate MAIN TUNING dial control over entire frequency range.	Counter indicates changing frequency trom 1305 to 1655 kc.	Replace Q1. Perform reference oscillator alignment contained in paragraph C.2.

TABLE 4-6

A3 MIXER - MODULATOR MODULE TROUBLE SHOOTING
(With 25 kc 0 dbm signal at INPUT jacks)
(SELECTOR to INPUT, FUNCTION to 600 ohms)

STEP	PROCEDURE	NORMAL INDICATION*	IF INDICATION IF ABNORMAL
1.	Set ATTENUATOR to 0 dBm and MAIN TUNING to 25 kc. Connect Wave Analyzer to pins 5 and 4 then 5 and 6 on transformer T2.	Wave analyzer indicates -6 dBm, 1330 kc signal, in both cases.	Check transformer T2.

*Some variation from these values is to be expected in different instruments.

TABLE 4-6 (Continued)

STEP	PROCEDURE	NORMAL INDICATION*	IF INDICATION IS ABNORMAL
2.	Connect wave analyzer to emitter of Q1.	Wave analyzer indicates -76 dbm, 25 kc signal.	Check transistor Q1. See voltage charts in Table 4-12.
3.	Connect Wave Analyzer to junction of C7 and C8. Tune Wave Analyzer to 1305 kc.	Wave analyzer indicates -83 dBm, 1305 kc signal.	Check diodes CR1 thru CR4. Check transistor Q2. See voltage charts in Table 4-12.

TABLE 4-7
A5 FIRST IF AMPLIFIER MODULE TROUBLE SHOOTING
(With 25 kc 0 dbm signal at INPUT jacks)

STEP	PROCEDURE	NORMAL INDICATION*	IF INDICATION IS ABNORMAL
1.	Set FUNCTION switch to 600 ohms ATTENUATOR to 0 dbm, SELECTOR to INPUT. Connect wave analyzer to base Q2, tune to 1305 kc.	Wave analyzer indicates -77 dBm, 1305 kc signal.	Perform first IF amplifier alignment contained in paragraph C.1. Check transistor Q1. See voltage charts in Table 4-12.
2.	Connect wave analyzer to base of Q3.	Wave analyzer indicates -65 dBm, 1305 kc signal.	Perform first IF amplifier alignment contained in paragraph C.1. Check transistor Q2. See voltage charts in Table 4-12.
3.	Connect wave analyzer to collector of Q3.	Wave analyzer indicates -50 dBm, 1305 kc signal.	Check transistor Q3. See voltage charts in Table 4-12.

* Some variation from these values is to be expected in different instruments.

TABLE 4-7 (Continued)

STEP	PROCEDURE	NORMAL INDICATION*	IF INDICATION IS ABNORMAL
4.	Connect wave analyzer collector of Q3. Tune to 1635 kc	Wave analyzer indicates -4 dBm, 1635 kc signal.	Check transistor Q4. See voltage charts in Table 4-12.
5.	Connect wave analyzer to collector of Q3. Tune to 330 kc.	Wave analyzer indicates -43 dBm, 330 kc signal.	Check transistor Q4. See voltage charts in Table 4-12.
6.	Connect wave analyzer to input of FL1.	Wave Analyzer indicates -38 dBm, 330 kc signal.	Check transistor Q5.
7.	Connect wave analyzer to emitter of Q7.	Wave analyzer indicates -45 dBm, 330 kc signal.	Check transistor Q7 and FL1. See voltage charts in Table 4-12.

TABLE 4-8

A7 SECOND IF AMPLIFIER MODULE TROUBLE SHOOTING

STEP	PROCEDURE	NORMAL INDICATION*	IF INDICATION IS ABNORMAL
1.	Place FUNCTION switch to 600 ohms. Set ATTENUATOR to 0 dbm. SELECTOR to INPUT. Connect VTVM to output of crystal filter FL1.	VTVM indicates -54 dBm.	Check FL1.
2.	Connect VTVM to collector of Q1.	VTVM indicates -37 dBm.	Perform second IF amplifier alignment contained in paragraph C.3. Check transistor Q1. See voltage charts in Table 4-12.
3.	Connect VTVM to collector of Q3.	VTVM indicates -20 dBm.	Perform second IF amplifier alignment contained in paragraph C.3. Check transistor Q3. See voltage charts in Table 4-12.

*Some variation from these values is to be expected in different instruments.

TABLE 4-8 (Continued)

STEP	PROCEDURE	NORMAL INDICATION*	IF INDICATION IS ABNORMAL
4.	Connect VTVM to collector of Q3. Rotate CAL control over entire range. Readjust CAL until meter of 127C reads 0 dBm.	VTVM indicates -45 dBm. to -11 dBm.	Check R13, C10, R12. Check transistor Q3. See voltage charts in TABLE 4-12.

TABLE 4-9

A8 METER DETECTOR MODULE TROUBLE SHOOTING

STEP	PROCEDURE	NORMAL INDICATION*	IF INDICATION IF ABNORMAL
1.	Connect VTVM to collector of Q2.	VTVM indicates -2 dBm, and meter indicates 0 dBm.	Check Q1, Q2. See voltage charts in Table 4-12.

TABLE 4-10

A6 AUDIO DETECTOR AND AMPLIFIER MODULE TROUBLE SHOOTING
(With 25 kc, 0 dBm, Modulated with 400 cps, 50%, signal at INPUT)

STEP	PROCEDURE	NORMAL INDICATION*	IF INDICATION IS ABNORMAL
1.	Set ATTENUATOR to 0 dBm, FUNCTION switch to 600 ohms SELECTOR to INPUT and AUDIO GAIN to full CW position. Connect VTVM to base of Q2.	VTVM indicates -27 dBm.	Check transistor Q1. See voltage chart in Table 4-12.

*Some variation from these values is to be expected in different instruments.

TABLE 4-10 (Continued)

STEP	PROCEDURE	NORMAL INDICATION*	IF INDICATION IS ABNORMAL
2.	Connect VTVM to collector of Q2.	VTVM indicates -6 dBm.	Check transistor Q2. See voltage chart Table 4-12.
3.	Connect VTVM to sleeve connection of 600 phones plugged into J6. If phones not available measure across open phone plug.	VTVM indicates +2 dBm. Phones reproduce 400 cycle tone.	Check transistors Q3, Q4. See voltage chart Table 4-12.

TABLE 4-11

A9 CARRIER REINSERTION OSCILLATOR MODULE TROUBLE SHOOTING

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1.	Connect VTVM to emitter of Q1.	VTVM indicates -15 dBm on either US or LS.	Check transistor Q1. See voltage chart Table 4-12.

*Some variation from these values is to be expected in different instruments.

4. TYPICAL TRANSISTOR TROUBLE SHOOTING.

The following procedures present typical trouble shooting for a pnp common emitter amplifier stage. See Table 4-11 for typical transistor voltages.

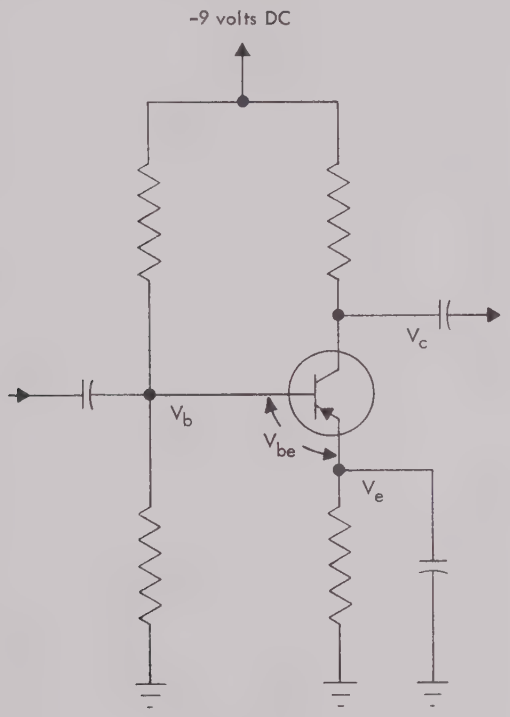


Figure 4-5. Typical Transistor Trouble Shooting Schematic

a. Check V_c (Figure 4-5). If indication is zero volts, the transistor collector or emitter junction is shorted. If indication is same as collector supply voltage, the emitter or collector junction is open. (Collector of emitter follower, however, will ordinarily be at the supply voltage.)

b. Check V_{be} (Figure 4-5). If indication is greater than normal, emitter junction is open. If indication is zero volts, the emitter junction is shorted. V_{be} is the difference between base and emitter voltages. ($V_b - V_e = V_{be}$).

c. Alternate method: Instead of voltage checks use "in circuit" transistor tester to check transistors.

TABLE 4-12

TRANSISTOR VOLTAGE MEASUREMENTS*

MODULE	TRANSISTOR	EMITTER	BASE	COLLECTOR
		v dc	v dc	v dc
A2	Q1	-0.34	-0.45	-2.4
	Q2	-0.35	+0.34	-3.0
A3	Q1	-7.75	-7.95	-9.0
	Q2	-0.65	-0.70	-9.0
A4	Q1	-4.0	-4.2	-6.5
	Q2	-4.0	-4.2	-9.0
A5	Q1	-0.42	-0.67	-4.4
	Q2	-0.42	-0.67	-4.4
	Q3	-0.60	-0.75	-5.5
	Q4	-0.65	-0.85	-4.1
	Q5	-4.0	-4.2	-7.5
	Q7	-4.6	-4.8	-9.0
A6	Q1	-2.1	-2.3	-4.0
	Q2	-3.0	-3.2	-9.0
	Q3	-8.9	-8.2	0
	Q4	-8.9	-8.2	0
A7	Q1	-0.95	-1.15	-9.0
	Q3	-4.4	-4.6	-9.0
A8	Q1	-0.35	-0.55	-2.0
	Q2	-1.8	-2.0	-5.1
A9	Q1	-0.50	-0.65	-4.7

*Taken with a VTVM. Readings should be within ±20%. Voltage is measured between transistor electrode and chassis.

C. ALIGNMENT AND ADJUSTMENTS

1. 1305 KC IF AMPLIFIER ALIGNMENT.

The alignment of the 1305 kc IF amplifier is performed by using the internal reference oscillator as a signal source. To align the 1305 kc IF amplifier proceed as follows:

a. Set voltmeter controls as follows:

FUNCTION	CAL
ATTENUATOR	0 CAL
MAIN TUNING	25 kc

b. Adjust CAL control until dBm reading is in upper half of scale.

c. Using a non-metallic tuning tool, adjust L1, L2, L3, L4 for maximum indication on dBm meter.

2. BALANCED MODULATOR ADJUSTMENT

This procedure adjusts the balanced modulator so that a minimum of local oscillator signal appears at the mixer output. To adjust the balanced modulator, proceed as follows:

a. Set voltmeter controls as in 1.a., above.

b. Adjust L1, located on A3, for a maximum meter reading.

c. Set frequency dial as close to 0 kc as possible without driging meter needle beyond full scale.

d. Adjust R5 and C5 on modulator Board A3 for a minimum meter reading.

3. 330 KC IF AMPLIFIER ALIGNMENT

The alignment of the 330 kc IF amplifier is performed by using the internal reference oscillator as a signal source. To align the 330 kc IF amplifier, proceed as follows:

a. Set voltmeter controls as in 1.a., above.

b. Adjust CAL control until dbm reading is in upper half of scale.

c. Using a non-metallic tuning tool, adjust L1 and L3 for maximum indication on dBm meter. A7

4. VARIABLE OSCILLATOR ALIGNMENT

The output of the reference oscillator adjusts the oscillator tracking from 25 kc to 325 kc.

a. Connect electronic counter to output of variable oscillator at ~~C10.~~ R6-A9

b. Set FUNCTION switch to CAL.

c. Set MAIN TUNING index to mid-range.

d. Rotate MAIN TUNING dial to 0.

e. Check that capacitor plates (C9) are within 1/16 inch of being fully meshed.

f. Rotate MAIN TUNING dial to 25 kc.

g. Adjust inductor, L2, until electronic counter indicates 1330 kc.

h. Rotate MAIN TUNING dial to 325 kc.

i. Adjust capacitor, C5, until electronic counter indicates 1630 kc.

j. Repeat steps f. through i. until oscillator tracks over entire tuning range ±1.0 kc. If tracking is not within tolerance, loosen setscrew holding capacitor shaft to tuning mechanism, readjust slightly and repeat steps f. through i.

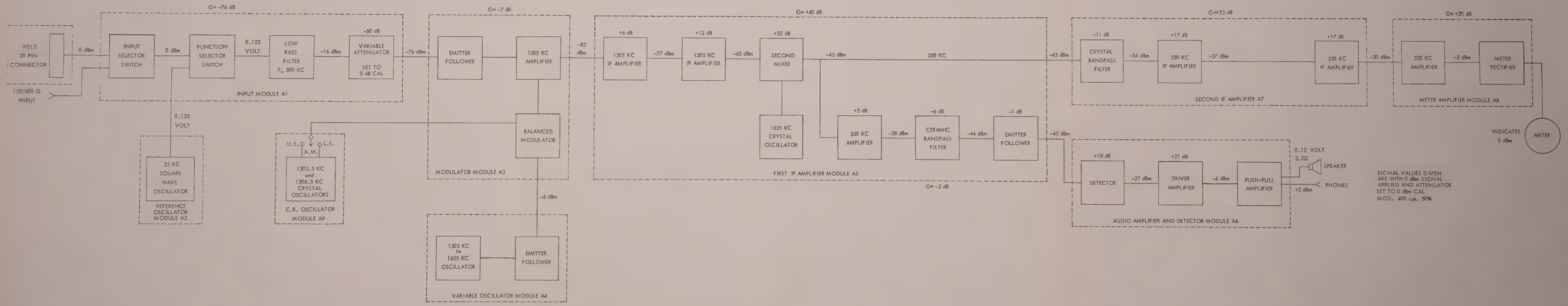


Figure 4-6. Model 127C Block Diagram

SECTION V

REPLACEABLE PARTS LIST

PARTS REPLACEMENT

Standard components have been used in this instrument whenever possible. Both standard and special components may be ordered direct from the factory.

When ordering parts always include:

1. Sierra Stock Number.
2. Circuit Reference and Commercial Description.
3. Name, Model and Serial Number of the Instrument.

Parts for this instrument, or further service information may be obtained from:

SIERRA ELECTRONIC DIVISION
Philco Corporation
3885 Bohannon Drive
Menlo Park, California 94025

Telephone (415) 322-7222
TWX 910-373-1282

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	A1 INPUT CIRCUIT				
C1	CAPACITOR, Silver Mica, 330 pF ±5%, 500VDCW	902000331	Elmenco	CM-15-E-331J	2
C2	CAPACITOR, Silver Mica, 620 pF ±5%, 300VDCW	902000621	Elmenco	CM-20-D-621J	3
C3	Same as C2				
C4	Same as C2				
C5	Same as C1				
C6	CAPACITOR, Tubular, 1 mF ±5%, 600VDCW	901060105	Goodall	X663F	1
C7	CAPACITOR, Tantalum, 10 mF, ±5%, 15VDCW	902700106	I.E.I. or T.I.	TDB246	3
J1	CONNECTOR, 20 Terminal	914800003	Cinch	47B14515	1
J2	BINDING POST, Insulated	915200012	General Radio	938-C	2
J3	Same as J2				
J4	BINDING POST, Ground	915200013	General Radio	938-A	1
	SHORT LINK	915200007	General Radio	938-L	1
L1	INDUCTOR, 690 µH ±5%	148391000	Sierra	SS-14839-1	4
L2	Same as L1				
L3	Same as L1				
L4	Same as L1				
R1	RESISTOR, Carbon Film, 998Ω ±1%, 1/2W	907400104	Electra	DC-1/2A	2
R2	RESISTOR, Wirewound, 2Ω ±1%, 1/2W	906100015	Gen. Resistor	HA02H	1
R3	Same as R1				
R4	RESISTOR, Carbon Film, 938.7Ω ±1%, 1/2W	907400105	Electra	DC-1/2A	2
R5	RESISTOR, Carbon Film, 63.3Ω ±1%, 1/2W	907400106	Electra	DC-1/2A	1
R6	Same as R4				
R7	RESISTOR, Carbon Film, 56.2Ω ±1%, 1/2W	907400107	Electra	DC-1/2A	1
R8	RESISTOR, Carbon Film, 43.8Ω ±1%, 1/2W	907400108	Electra	DC-1/2A	1
R9	RESISTOR, Carbon Film, 78.0Ω ±1%, 1/2W	907400109	Electra	DC-1/2A	1
R10	RESISTOR, Carbon Film, 138.0Ω ±1%, 1/2W	907400110	Electra	DC-1/2A	1
R11	RESISTOR, Carbon Film, 246Ω ±1%, 1/2W	907400111	Electra	DC-1/2A	1
R12	RESISTOR, Carbon Film, 438Ω ±1%, 1/2W	907400112	Electra	DC-1/2A	1
R13	RESISTOR, Carbon Film, 880Ω ±1%, 1/2W	907400113	Electra	DC-1/2A	1
R14	RESISTOR, Carbon Film, 100Ω ±1%, 1/2W	907400114	Electra	DC-1/2A	1
S1	SWITCH, 5 Position	911200071	Sierra	SS-14826-1	1
S2	SWITCH, 17 Position	911200082	Sierra	A01482500	1
S3	SWITCH, 12 Position	911200084	Sierra	SS-14827-1	1
S4	SWITCH, 3 Position	911200058	Sierra	SS-14206-1	1
T1	TRANSFORMER	125233000	Sierra	SA-12523-3	1

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	A2 REFERENCE OSCILLATOR MODULE C02813000				
C1	CAPACITOR, S.M., 5100 pF ±1%, 300WVDC	901910512	Elmenco	DM19F512F	1
C2	CAPACITOR, Metalized Paper, .047 mF ±10%, 100WVDC	902400273	Sprague	196P47391S2	1
C3	CAPACITOR, Disc.,0.1 mF ±20%, 50WVDC	901410104	Sprague	33C41	19
C4	CAPACITOR, Tantalum, 10 mF, 15WVDC	902740106	I.E.I. or T.I.	TD246	*
C5	Same as C3				
C6	Same as C3				
CR1	DIODE, Zener, 1N753 (6.2 Volts)	910500001	T.I.	1N753	1
CR2	DIODE, Silicon, 1N815 9105036C4	~~910500010~~	Transitron	1N815	2
CR3	DIODE, Germanium, 1N995	910500003	Transitron	1N995	1
CR4	Same as CR2				
L1	COIL, 10 mH ±2%	909000117	J.W. Miller	70F102A1 ±2%	2
L2	Same as L1				
Q1	TRANSISTOR	910300007	RCA	2N404	3
Q2	Same as Q1				
R1	RESISTOR, Comp., 270Ω ±5%, 1/2W	905000271	A.B.	EB	5
R2	RESISTOR, Comp., 68KΩ ±5%, 1/2W	905000683	A.B.	EB	2
R3	RESISTOR, Comp., 5.6KΩ ±5%,1/2W	905000562	A.B.	EB	3
R4	RESISTOR, Comp., 560Ω ±5%, 1/2W	905000561	A.B.	EB	2
R5	RESISTOR, Comp., 100KΩ ±5%, 1/2W	905000104	A.B.	EB	1
R6	RESISTOR, Comp., 10KΩ ±5%, 1/2W	905000103	A.B.	EB	4
R7	RESISTOR, Comp., 3.9KΩ ±5%, 1/2W	905000392	A.B.	EB	4
R8	RESISTOR, Comp., 4.7KΩ ±5%, 1/2W	905000472	A.B.	EB	12
R9	POTENTIOMETER, PC Mtg., 1KΩ	907900101	Stackpole	LH61	1
R10	RESISTOR, Comp., 180Ω ±5%, 1/2W	905000181	A.B.	EB	1
Y1	CRYSTAL, 25,000 c/s, .01%, 1 mW Sens.	912200020	Sierra	A01534700	1
	A3 MIXER - MODULATOR MODULE				
C1	CAPACITOR, Tantalum, 10 mF, ±10%, 15 WVDC	902740106	I.E.I. or T.I.	TDB246	*
C2	Same as C1				

*Previously Accounted For

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	A3 MIXER - MODULATOR MODULE (Continued)				
C3	Same as C1				
C4	CAPACITOR, Dura Mica, 5 pF, 500V	901900050	Elmenco	CM-15-050K	1
C5	CAPACITOR, Var. Glass-Plastic, .8-8.5 pF	903000885	Erie	563-013	1
C6	CAPACITOR, Disc Ceramic, .01 µF, 150V	901440103	Centralab	DDM-103	25
C7	CAPACITOR, Dura Mica, 1000 pF ±5%, 500V	901910102	Elmenco	DM19-102J	2
C8	CAPACITOR, Dura Mica, 270 pF, 500V	901900271	Elmenco	DM15-271J	1
C9	Same as C6				
C10	Same as C1				
CR1	DIODE, HD 1871E	910500033	Hughes	HD1871E	4
CR2	Same as CR1				
CR3	Same as CR1				
CR4	Same as CR1				
L1	COIL, 552µH, Q=50	162521000	Sierra	94 x 25	1
Q1	TRANSISTOR	910300008	Sprague	2N1728	17
Q2	Same as Q1				
R1	RESISTOR, Comp., 3.9KΩ ±10%, 1/2W	905200392	AB	EB	1
R2	RESISTOR, Comp., 33KΩ ±10%, 1/2W	905200333	AB	EB	1
R3	RESISTOR, Comp., 56KΩ ±10%, 1/2W	905200563	AB	EB	1
R4	RESISTOR, Comp., 6.8KΩ ±10%, 1/2W	905200682	AB	EB	1
R5	RESISTOR, Cermet Trimmer, 200Ω, ±10%	907900218	CTS	180PC201A	1
R6	RESISTOR, Comp., 390Ω ±5%, 1/2W	905000391	AB	EB	4
R7	Same as R6				
R8	Same as R6				
R9	Same as R6				
R10	RESISTOR, Comp., 22KΩ ±5%, 1/2W	905000223	AB	EB	6
R11	RESISTOR, Comp., 27KΩ ±5%, 1/2W	905000273	AB	EB	1
R12	RESISTOR, Comp., 3.3KΩ ±5%, 1/2W	905000332	AB	EB	2
R13	Not Used				
R14	Not Used				
R15	Not Used				
R16	Not Used				
R17	RESISTOR, Comp., 330Ω ±10%, 1/2W	905200331	AB	EB	1
T1	TRANSFORMER, 1 (C.T.): (C.T.)	909900018	Pulse	PE5182	2
T2	Same as T1				

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	A4 VARIABLE OSCILLATOR MODULE				
C1	CAPACITOR, Disc., .01 mF ±20%, 600WVDC	901420103	Centralab	DD6-103	*
C2	CAPACITOR, Silver Mica, 150pF ±5%, 500WVDC	902010151	Elmenco	CM-15-E-151	2
C3	CAPACITOR, Silver Mica, 1000 pF ±5%,500WVDC	902010102	Elmenco	CM-20-F-102	2
C4	CAPACITOR, Silver Mica, 4,700 pF ±5%,300WVDC	902010472	Elmenco	CM-20-E-472	3
C5	CAPACITOR, Variable, 5-25 pF, NPO	903210250	Erie	557-F	1
C6	CAPACITOR, Silver Mica, 22 pF ±1%, 500WVDC	902000220	Elmenco	CM-15-C-220	1
C7	Same as C1				
C8	CAPACITOR, Rod T.C., 22 pF ±2%	901410220	Centralab	TCA-22	2
C9	CAPACITOR, Variable Air, 7.5-80 pF	902800750	Hammarlund	SS-15948-3	1
C10	Same as C1				
C11	CAPACITOR, Feed Through, .0015 mF ±20%, 500WVDC	902610152	Erie	26-M-152	1
C12	CAPACITOR, Disc., .1 µF +80%-20%,50 WVDC	901410104	Sprague	33C41	*
C13	Same as C12				
C14	Same as C8				
L1	COIL, 47 µH ±5%, 50 mA	909000107	Miller	70F475A1	1
L2	COIL, 67-135 µH	A01749100	Sierra	SS-17491-1	1
L3	COIL, 330 µH ±5%, 50 mA	909000106	Miller	70F334A1	7
Q1	TRANSISTOR, Type 2N1728	910300008	Sprague	2N1728	*
Q2	Same as Q1				
R1	RESISTOR, Composition, 5.6KΩ ±10%, 1/2W	905200562	AB	EB	3
R2	RESISTOR, Composition, 1.5KΩ ±10%, 1/2W	905200152	AB	EB	3
R3	Same as R1				
R4	RESISTOR, Composition, 2.7KΩ ±10%, 1/2W	905200272	AB	EB	2
R5	RESISTOR, Composition, 12KΩ ±10%, 1/2W	905200123	AB	EB	2
R6	Same as R5				
R7	Same as R2				
R8	RESISTOR, Variable 1KΩ	907900129	AB	GA1G040S102MA	1
R9	Same as R2				
	A5A FIRST IF AMPLIFIER MODULE				
C1	CAPACITOR, Disc., .01 mF ±20%, 600VDCW	901420103	Centralab	DD6-103	*
C2	Same as C1				
C3	CAPACITOR, Mica, 4700 pF ±5%, 500WVDC	901900472	Elmenco	DM-19-472J	4
C4	Not used				
C5	CAPACITOR,Silver Mica, 56 pF ±5%, 500WVDC	902000560	Elmenco	CM-15-E-560	2
C6	Same as C3				
C7	Same as C1				
C8	Same as C1				
C9	Same as C3				
C10	Same as C1				

*Previously Accounted For

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	A5A FIRST IF AMPLIFIER MODULE (Continued)				
C11	Same as C5				
C12	Same as C3				
C13	Same as C1				
C14	Same as C1				
L1	COIL, 3.2 µH	148301000	Sierra	SS-14830-1	4
L2	Same as L1				
L3	Same as L1				
L4	Same as L1				
Q1	TRANSISTOR, Type 2N1728	910300008	Sprague	2N1728	*
Q2	Same as Q1				
Q3	Same as Q1				
R1	RESISTOR, Comp., 4.7KΩ ±5%, 1/2W	905000472	AB	EB	*
R2	RESISTOR, Comp., 22KΩ ±5%, 1/2W	905000223	AB	EB	*
R3	Same as R1				
R4	RESISTOR, Comp., 270Ω ±5%, 1/2W	905000271	AB	EB	*
R5	Same as R4				
R6	Same as R1				
R7	Same as R2				
R8	Same as R1				
R9	Same as R4				
R10	Same as R4				
R11	RESISTOR, Comp., 5.6KΩ ±5%, 1/2W	905000562	AB	EB	*
R12	Same as R2				
R13	RESISTOR, Comp., 2200Ω ±5%, 1/2W	905000222	AB	EB	1
R14	RESISTOR, Comp., 1KΩ ±5%, 1/2W	905000102	AB	EB	2
	A5B 2ND LO AND AUDIO IF AMPLIFIER MODULE				
C15	CAPACITOR, Silver Mica, 47 pF ±5%, 500WVDC	902010470	Elmenco	CM-15-E-470	2
C16	CAPACITOR, Silver Mica, 1000 pF ±5%,500WVDC	902010102	Elmenco	CM-20-E-102	*
C17	CAPACITOR, Silver Mica, 100 pF ±5%, 500WVDC	902010101	Elmenco	CM-15-E-101	1
C18	CAPACITOR, Disc Ceramic,.01 µF ±20%,600WVDC	901420103	Centralab	DD6-103	*
C19	Same as C15				
C20	Same as C18				
C21	Same as C18				
C22	Same as C18				
C23	Same as C18				
C24	Not Used				

*Previously Accounted For

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	A5B 2ND LO AND AUDIO IF AMPLIFIER MODULE (Continued)				
C25	Not Used				
C26	Same as C18				
C27	CAPACITOR, Disc Ceramic, 0.1 μF ±20%, 50WVDC	901410104	Sprague	33C41	*
FL1	FILTER, Band-Pass, Ceramic, 330 kc, 2.5 kc PB	910100010	Sierra	SS-17184-1	1
L5	COIL, Choke, 3.3 mH, ±10%	909000116	J. W. Miller	70F333A1	3
L6	COIL, Choke, 330 μH, ±10%	909000106	J. W. Miller	70F334A1	*
L7	Same as L6				
Q4	TRANSISTOR	910300008	Sprague	2N1728	*
Q5	Same as Q4				
Q6	Not Used				
Q7	Same as Q4				
R15	RESISTOR, Comp., 4.7KΩ ±5%, 1/2W	905000472	AB	EB	*
R16	RESISTOR, Comp., 47KΩ ±5%, 1/2W	905000473	AB	EB	1
R17	Same as R15				
R18	RESISTOR, Comp., 680Ω ±5%, 1/2W	905000681	AB	EB	1
R19	RESISTOR, Comp., 3.3KΩ ±5%, 1/2W	905000332	AB	EB	1
R20	RESISTOR, Comp., 12KΩ ±5%, 1/2W	905000123	AB	EB	1
R21	RESISTOR, Comp., 10KΩ, ±5%, 1/2W	905000103	AB	EB	*
R22	RESISTOR, Comp., 27Ω ±5%, 1/2W	905000270	AB	EB	2
R23	RESISTOR, Comp., 3.9KΩ ±5%, 1/2W	905000392	AB	EB	*
R24	Not Used				
R25	Not Used				
R26	Not Used				
R27	Not Used				
R28	Not Used				
R29	RESISTOR, Comp., 3.3KΩ ±5%, 1/2W	905000332	AB	EB	*
R30	Same as R23				
R31	Same as R15				
Y1	CRYSTAL, 1635 kc, ±.005%	912200032	Sierra	A02033900	1
	A6 AUDIO AMPLIFIER AND DETECTOR MODULE				
C1	CAPACITOR, Disc, 0.1 mF ±20%, 50WVDC	901410104	Sprague	33C41	*
C2	Same as C1				

*Previously Accounted For

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	A6 AUDIO AMPLIFIER AND DETECTOR MODULE (Continued)				
C3	CAPACITOR, Tantalum 22 mF, 15WVDC	902740226	T.I.	SCM226BP015A4	2
C4	CAPACITOR, Mica, 1000 pF ±5%, 500WVDC	901910102	Elmenco	DM-19J-102	1
C5	CAPACITOR, Mica, 1500 pF ±5%, 500 WVDC	901910152	Elmenco	DM-19J-152	2
C6	CAPACITOR, Tantalum, 10 mF, 15WVDC	902700106	T.I.	SCM106BP015A4	*
C7	Same as C3				
C8	Same as C1				
C9	CAPACITOR, Disc., .047 mF	901400473	Sprague	55C60	3
C10	Same as C9				
C11	Same as C9				
CR1	DIODE, Germanium, 1N191	910600191	Sylvania	1N191	3
CR2	DIODE, Silicon, 1N456	910500031	Sylvania	1N456	1
J5	SOCKET, With Angle Brackets, 2 Contact	914200029	Cinch Jones	261-12-02-010	1
J6	JACK, Phone with NC Tip Contact	914400011	Switchcraft	Type 12A	1
J7	JACK, Phone 2 Cond.	914400003	Switchcraft	Type 11	1
Q1	TRANSISTOR	910300008	Sprague	2N1728	*
Q2	TRANSISTOR	910300007	RCA	2N404	*
Q3	TRANSISTOR	910300033	GE	7A31	2
Q4	Same as Q3				
R1	RESISTOR, Comp., 22KΩ ±5%, 1/2W	905000223	AB	EB	*
R2	RESISTOR, Comp. 8.2 KΩ ±5%, 1/2W	905000822	AB	EB	2
R3	RESISTOR, Comp., 150KΩ ±5%, 1/2W	905000154	AB	EB	1
R4	RESISTOR, Comp., 2.2KΩ ±5%, 1/2W	905000222	AB	EB	1
R5	RESISTOR, Comp., 10KΩ ±5%, 1/2W	905000103	AB	EB	*
R6	RESISTOR, Comp., 4.7KΩ ±5%, 1/2W	905000472	AB	EB	*
R7	RESISTOR, Comp., 15KΩ ±5%, 1/2W	905000153	AB	EB	1
R8	Same as R2				
R9	Same as R5				
R10	RESISTOR, Comp., 330Ω ±5%, 1/2W	905000331	AB	EB	2
R11	RESISTOR, Comp., 2.7KΩ ±5%, 1/2W	905000272	AB	EB	1
R12	Same as R6				
R13	RESISTOR, Comp., 10Ω ±5%, 1/2W	905000100	AB	EB	2
R14	Same as R13				
R15	RESISTOR, Comp., 1KΩ ±5%, 1/2W	905000102	AB	EB	*
R16	RESISTOR, Comp., 27Ω ±5%, 1/2W	905000270	AB	EB	1
R17	POTENTIOMETER, 5KΩ, Linear Taper, 2W	907900196	TRC	PQ 11-114	1
S5	SWITCH, SPST (Part of R17)		IRC	76-1	

*Previously Accounted For

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	A6 AUDIO AMPLIFIER AND DETECTOR MODULE (Continued)				
T1	TRANSFORMER, Driver, 10K Pri, 2K CT Sec.	910000072	UTC	SS0-8	1
T2	TRANSFORMER, Output, 500Ω CT, Pri. 3.2Ω Sec.	910000073	UTC	S0-9	1
	A7 2ND IF AMPLIFIER MODULE				
C1	CAPACITOR, Disc., .01 mF ±20%, 600WVDC	901420103	Centralab	DD6-103	*
C2	Same as C1				
C3	Same as C1				
C4	CAPACITOR, Silver Mica, 4,700 pF ±5%, 300WVDC	902010472	Elmenco	CM-20-E-4721	*
C5	Not Used				
C6	Not Used				
C7	Not Used				
C8	Same as C1				
C9	Same as C4				
C10	Same as C1				
C11	Same as C1				
C12	CAPACITOR, Disc., 0.1 mF +80 -20%, 50V	901410104	Sprague	33C41	*
C13	Same as C12				
C14	Same as C12				
FL1	FILTER, Crystal, BP., 330 kc, 240 c/s BW	910100008	Sierra	SS-13491-1	1
L1	COIL, Variable, 50 μH	148401000	Sierra	SS-14840-1	2
L2	Not Used				
L3	Same as L1				
L4	COIL, Choke, 330 μH, ±10%	909000106	J. W. Miller	70F334A1	*
L5	Same as L4				
L6	Same as L4				
Q1	TRANSISTOR	910300008	Philco	2N1728	*
Q2	Not Used				
Q3	Same as Q1				
R1	RESISTOR, Composition, 4.7KΩ ±5%, 1/2W	905000472	AB	EB	*
R2	RESISTOR, Composition, 68KΩ ±10%, 1/2W	905200683	AB	EB	1
R3	RESISTOR, Composition, 10KΩ ±10%, 1/2W	905200103	AB	EB	1
R4	RESISTOR, Composition, 1KΩ ±10%, 1/2W	905200102	AB	EB	1
R5	RESISTOR, Composition, 560Ω ±10%, 1/2W	905200561	AB	EB	1
R6	Not Used				
R7	Not Used				
R8	Not Used				

*Previously Accounted For

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	A7 2nd IF AMPLIFIER MODULE (Continued)				
R9	Not Used				
R10	RESISTOR, Composition, 22KΩ ±10%, 1/2W	905200223	AB	EB	2
R11	Same as R10				
R12	RESISTOR, Composition, 56Ω ±10% , 1/2W	905200560	AB	EB	1
R13	POTENTIOMETER, Linear Taper, 5KΩ ±30%, 1/2W	907900130	Stackpole	L	1
	A8 METER AMPLIFIER MODULE				
C1	CAPACITOR, Disc, 0.1 mF ±20%, 50WVDC	901410104	Sprague	33C41	*
C2	Same as C1				
C3	Same as C1				
C4	Same as C1				
C5	Same as C1				
C6	Same as C1				
C7	Same as C1				
CR1	DIODE, Germanium	910600191	Transitron	1N191	*
CR2	Same as CR1				
L1	INDUCTOR, 3.3 mH, RFC	909000116	Miller	70F333A1	*
L2	Same as L1				
M1	METER, 200 Microamperes	911800063	Sierra	C01946900	1
Q1	TRANSISTOR	910300008	Philco	2N1728	*
Q2	Same as Q1				
R1	RESISTOR, Composition, 68KΩ ±5%, 1/2W	905000683	AB	EB	*
R2	RESISTOR, Composition, 5.6KΩ ±5%, 1/2W	905000562	AB	EB	*
R3	RESISTOR, Composition, 6.8KΩ ±5%, 1/2W	905000682	AB	EB	2
R4	RESISTOR, Composition, 330Ω ±5%, 1/2W	905000331	AB	EB	*
R5	RESISTOR, Composition, 22KΩ ±5%, 1/2W	905000223	AB	EB	*
R6	Same as R3				
R7	RESISTOR, Composition, 3.9KΩ ±5%, 1/2W	905000392	AB	EB	*
R8	RESISTOR, Composition, 1.8KΩ ±5%, 1/2W	905000182	AB	EB	2
R9	RESISTOR, Composition, 560Ω ±5%, 1/2W	905000561	AB	EB	*
R10	RESISTOR, Composition, 150Ω ±5%, 1/2W	905000151	AB	EB	*
R11	RESISTOR, Dep. Carb., 46,240Ω ±1%, 1/2W	907400141	Electra	DC 1/2A	1

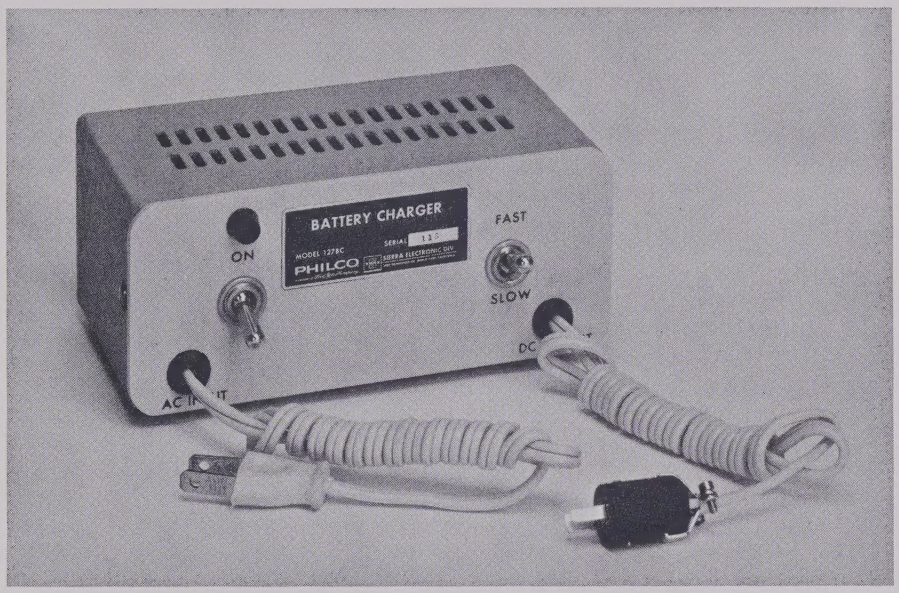
*Previously Accounted For

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	A9 CARRIER REINSERTION AMPLIFIER MODULE				
C1	CAPACITOR, Silver Mica, 470 pF ±5%, 300WVDC	902010471	Elmenco	CM-15E-471F	1
C2	CAPACITOR, Disc, .01 mF, 150WVDC	901440103	CRL 9019 00271	DDM-103	1
C3	CAPACITOR, Silver Mica, ~~68 pF~~ ±5%, 300WVDC	~~902010680~~	Elmenco	CM-15E-680F	1
C4	CAPACITOR, Silver Mica, ~~150 pF~~ ±5%, 300WVDC	~~902010151~~	Elmenco	CM-15E-151F	*
C5	CAPACITOR, Tantalum, 1.0 mF ±20%, 15WVDC	902750105	T.I. 9019 00681	SCM105PF015A4	1
L1	COIL, RF Choke 330 µH ±10%	909000106	J. W. Miller	70F334A1	*
Q1	TRANSISTOR	910300008	Sprague	2N1728	*
R1	RESISTOR, Composition, 47KΩ ±10%, 1/2W	905200473	AB	EB	1
R2	RESISTOR, Composition, 4.7KΩ ±10%, 1/2W	905200472	AB	EB	1
R3	RESISTOR, Composition, 5.6KΩ ±10%, 1/2W	905200562	AB	EB	*
R4	RESISTOR, Composition, ~~180Ω ±10%~~, 1/2W 100~	~~905200181~~	AB	EB	1
R5	RESISTOR, Composition, 470Ω ±10%, 1/2W	905200471	AB	EB	1
R6	RESISTOR, Composition, 2.7KΩ ±10%, 1/2W	905200272	AB	EB	*
Y1	CRYSTAL, ~~1303.500~~ kc ±.005%	912200033	Sierra	A02034000	1
Y2	CRYSTAL, ~~1306.500~~ kc ±.005%	912300034	Sierra	A02034100	1
	A10 ELECTRICAL METER DAMPING MODULE				
C1	CAPACITOR, Tant., 180 µF ±10%, 6WVDC	902700187	Sprague	150D187X9006R2	1
R1	RESISTOR, Composition, 1.8KΩ ±5%, 1/2W	905000182	AB	EB	*
	MISCELLANEOUS				
BTY1	BATTERY, Zinc Carbon, 1.5 Volts, Size D	918500006	Burgess	2R	6
BTY2	Same as BTY1				
BTY3	Same as BTY1				
BTY4	Same as BTY1				
BTY5	Same as BTY1				
BTY6	Same as BTY1				
LS1	LOUDSPEAKER 3.2Ω Voice Coil, 2-1/2" Dia.	921400001	Quam	25A05	1

* Previously Accounted For

MODEL 127BC
BATTERY CHARGER



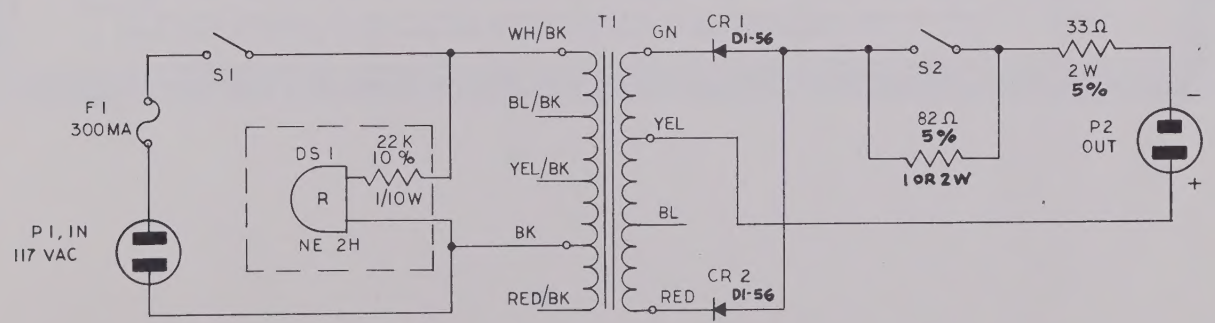
The 127BC is designed to charge the 3A/H Nickel-Cadmium batteries when the rechargeable battery pack is used with the Model 127A-Y and 127A-CR Frequency Selective Voltmeters.

The unit contains a step-down, isolation transformer and a silicon diode full-wave rectifier. A front panel switch selects either FAST charge, 160 ma, or SLOW charge, 50 ma. The output is not filtered since the batteries can only be charged when the Voltmeter function switch is in the OFF(CHARGE) position. Output current is limited by a 33 ohm series resistor. AC input is controlled by a front panel switch and power ON is indicated by a neon panel lamp. A 300 ma pigtail protective fuse is installed inside the case.

Two cords are integral to the unit, INPUT for 117v, 50/60 cycle AC, and OUTPUT with a polarized plug to fit J1, the charging receptacle on the rear of the Voltmeter.

The unit is housed in an aluminum case.

Dimensions are: 6-1/8" wide, 2-5/8" high and 4-1/8" depth overall.



127BC Battery Charger Schematic Diagram

Manufactured by

SIERRA ELECTRONIC DIV.
OF
PHILCO
A SUBSIDIARY OF Ford Motor Company

TELEPHONE (415) 322-7222 TWX 910-373-1282

Warranty

SIERRA ELECTRONIC DIVISION, PHILCO CORPORATION warrants instruments manufactured by it and bearing Sierra commercial model numbers, except Ion Gauge Tubes, to be free from defective material and factory workmanship and agrees to repair such instruments, which under normal use and service, disclose the defect to be the fault of our manufacturing. Our obligation under this warranty is limited to repairing any such instrument which in our sole opinion upon our examination proves to be so defective, when returned to our factory, transportation prepaid by the purchaser, within one year from the date of original purchase from us.

This warranty does not apply to any of our products which have been repaired, worked upon or altered by persons not authorized by us so as, in our sole judgment, to injure the stability or reliability of such instrument, or which have been subject to misuse, negligence or accident, or the serial number of which has been altered, effaced, or removed. Neither does this warranty apply to any of our products which have been connected, installed, used or adjusted otherwise than in accordance with the instructions furnished by us. Nor does SIERRA ELECTRONIC DIVISION, PHILCO CORPORATION assume any liability for consequential damages, and in any event our liability shall in no case exceed the original purchase price of the instrument. Accessories, including but not limited to all vacuum tubes, fuses and batteries, not of our manufacture used with this product are not covered by this warranty.

SIERRA ELECTRONIC DIVISION, PHILCO CORPORATION reserves the right to make changes in the design or construction of any of its instruments at any time without incurring any obligation to make any changes whatever on units previously purchased.

This warranty is in lieu of all other warranties expressed or implied and no representative or person is authorized to represent nor assume for us any liability in connection with the sale of our products other than set forth herein.